

UK Patent Application (19) GB (11) 2 122 714 A

(21) Application No 8317230

(22) Date of filing 24 Jun 1983

(30) Priority data

(31) 392983

(32) 28 Jun 1982

(33) United States of America (US)

(43) Application published 18 Jan 1984

(51) INT CL³

F16L 11/12

(52) Domestic classification F2P 1A13 1A19B 1B7D C3 U1S 1820 2013 F2P

(56) Documents cited

GB 1336215

GB 1290548

GB 1194078

GB 1036459

GB 0784060

GB 0778577

(58) Field of search

F2P

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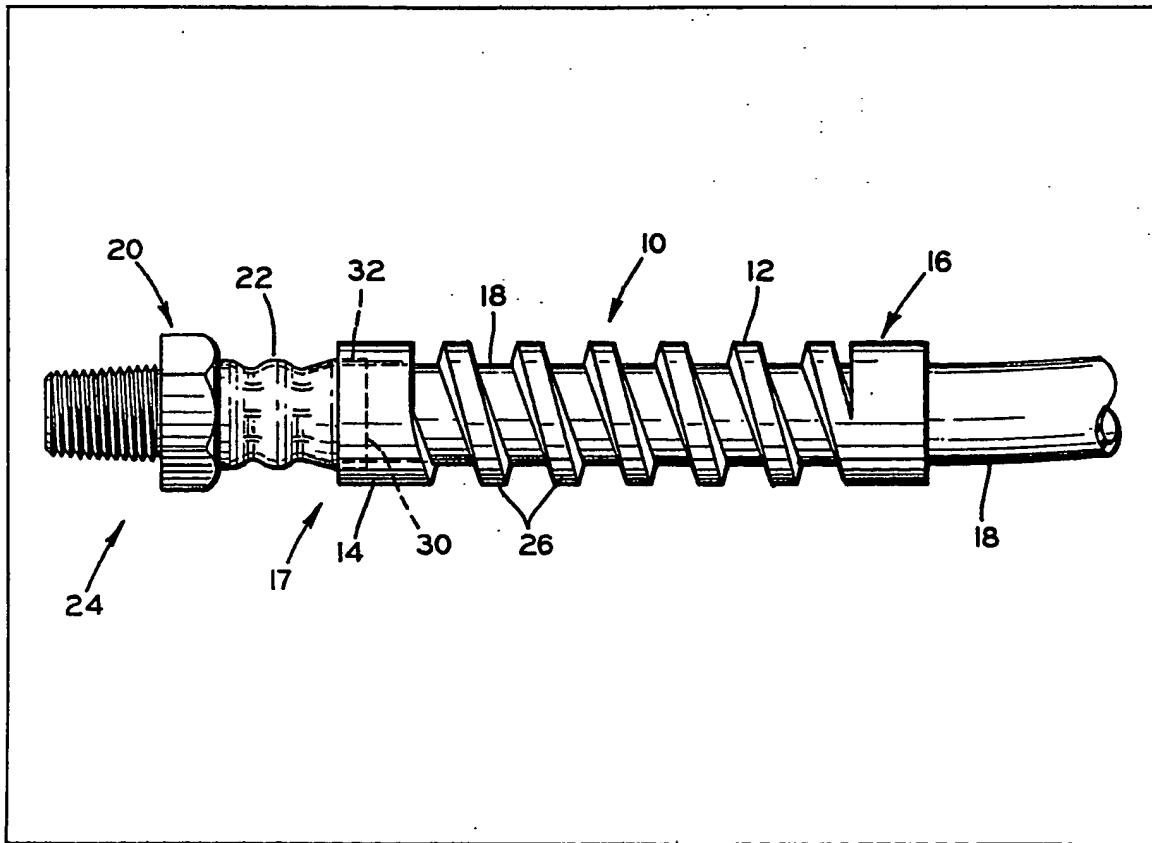
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**(54) Protective routing sleeve for
hose assemblies**

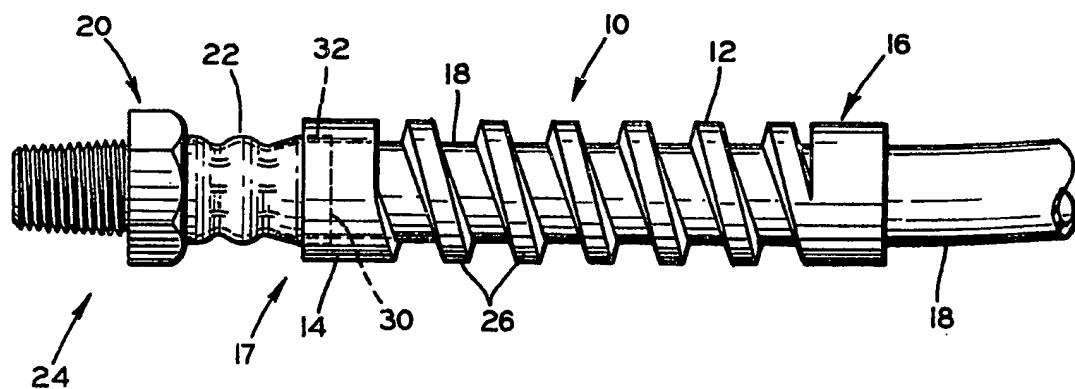
(57) A flexible corrosion-resistant
tubular sleeve provides protection for
hose assemblies subjected to
abrasion, kinking, or accidental
rupture due to flexure. The sleeve also
provides routing control for hose end
assemblies, providing greater axial
strength, yet greater flexibility by the
incorporation of a helically disposed
rib body portion. In a preferred
embodiment, the sleeve is a single-
piece body of molded polypropylene,
and defines a pair of annular end
portions intermediately and integrally
joined together by a helical structural
member.



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SPECIFICATION

Protective routing sleeve for hose assembly

Background of the Invention

This invention relates to sleeves installed on flexible hose assemblies for protection thereof, and for providing routing control of hose end assemblies. More particularly, the invention relates to such members having helical bodies installed over flexible hose lines for these purposes.

Many devices are employed for protection and routing control of hose assemblies. For example, rubber sleeves are installed over hydraulic brake lines which are typically mounted on the chassis of an automobile. As such lines are routed to movable front and rear suspension members which lead to individual wheel cylinders, the relative movement between the suspension member and chassis parts creates an adverse environment for flexible hose by virtue of abrasion, chafing, or rubbing action. For reasons of strength, typical fittings are made of steel materials, which are susceptible to corrosion and subsequent failure when exposed to moisture. The rubber sleeves generally have a slightly larger inside diameter than the outside diameter of the hose to be covered, and are typically installed over the hose prior to crimping of a steel fitting to the hose. After installation and crimping of the fitting to the hose, the protective routing member is then pulled over the connected end of the metal fitting. For convenience of sliding the routing member over the hose and over the fitting, the routing member moves relatively easily over the hose as a result of a clearance space created by the difference between the inside diameter of the routing member and the outside diameter of the hose. However, the clearance subjects the fitting to intrusion of moisture, wherein the fitting becomes corroded and subject to failure.

Other routing devices have incorporated materials not subject to corrosion. For example, routing devices have also been made of inert materials including plastics such as polyethylene terephthalate. The surface hardesses of such materials, however, have often been too great, resulting in abrasion of the associated hose assembly. Moreover, the latter devices have not possessed the requisite combination of flexibility and stiffness for good routing control.

Even where such devices have incorporated helical bodies, the operating characteristics of their structures have been less than desirable. For example, one plastic coil sleeve device must be physically wrapped about the hose member, and although quite flexible is without adequate stiffness for proper routing control. Another type of helical protective coil sleeve is made of steel, which of course is subject to corrosion. Moreover, the ends of the steel sleeve are often not flexible enough, and end-gouging damage and localized abrasion of the hose occurs. These factors result in an accelerated demise of the hose assembly, which may be subject to catastrophic rupture. This

problem has been particularly acute where for example elastomeric hose is utilized for carrying high pressure liquids in systems involving cycle pressure changes. Under the latter conditions of operation, periodic movements of the external hose assembly will subject the hose material to damage by the rubbing thereof against associated mechanical members.

One other major drawback of prior art routing devices is in the lack of such devices to overlie a portion of a fitting on a hose end. To the extent that many of such devices are not designed to overlie and to be rigidly affixed to end fittings of hoses, the devices do not ensure adequate flexure protection to the hose portion at which the fitting is attached.

Thus a protective hose routing sleeve is needed which will provide a resilient, yet flexible external protection for a hose member, and particularly for an elastomeric hose for carrying high pressure hydraulic fluids.

Summary of the Invention

This invention provides an improved protective member for hose lines which are subject to abrasion, kinking, or accidental rupture under conditions of cyclic flexure. Thus a resilient tubular sleeve provides an improved routing control of hose assemblies by the incorporation of a structural helical rib body portion made of a flexible, yet relatively stiff, non-corrosive material.

In a preferred embodiment, the sleeve is a single-piece tubular member molded over a hose end assembly. As such, the sleeve is rigidly affixed to a hose end fitting as well as to the connective hose portion to which the fitting is installed. This accommodation prevents deleterious moisture intrusion and resultant corrosion of the associated end fitting, and thus fully protects the fitting at the hose interface, unlike prior devices.

The sleeve contains a structural body portion which defines a helical structure, the ends of which are integrally joined to a pair of annular members. The sleeve is made of a relatively soft-corrosion-resistant material, preferably a molded polypropylene.

Brief Description of the Drawing

The drawing figure is a full side view of a preferred embodiment of the protective routing sleeve of this invention.

Detailed Description of a Preferred Embodiment

A protective routing sleeve 10 in accordance with a preferred embodiment of this invention is shown in the drawing figure. The sleeve 10 as herein described is of a molded polypropylene material, and includes a helical structural spring body portion 12 integrally molded with, and hence integrally joined to annular end members 14 and 16. The sleeve is directly molded onto a hose assembly 17, which consists of a hose member 18 and a fitting element 20. In the example described herein, the hose member 18 is made of an elastomeric material. Also by way of example, the

element 20 is a threaded male connector which is crimped onto the hose at 22, for connection of one end 24 of the hose member 18 to another hydraulic system member (not shown). The 5 connector 20 may alternatively be bonded to the hose member or affixed by still other means. The sleeve 10 is directly molded about the interface 32 of the connector 20 and the hose member 18 so as to partially overlie the crimped portion 22 of 10 the threaded connector element 20, thereby forming a routing member permanently affixed to both fitting and hose members. The interface 32 of the connector 20 and the hose member 18 will be such that the flared end 30 of the connector 15 element 20 will be fully encapsulated by the molded polypropylene material of the annular end member 14.

It will now be appreciated by those skilled in the art that the routing sleeve 10 will provide a 20 superior protective member for the hose assembly 17, as most connector fitting of the type represented by element 20 are fabricated of steel materials for reasons of strength. Although such members are plated with corrosion resistant 25 metals, for example zinc, it will be appreciated that the zinc plating will occasionally deteriorate or flake away, leaving the steel exposed to moisture contamination. Although alternate materials have been tried, for example brass and aluminum, the 30 latter have been unsatisfactory for several reasons including lack of strength. For instance, brass cannot be subjected to the high torques necessary for providing adequate closure, while aluminum is unduly subject to galvanic action and stress 35 corrosion. Thus the present invention provides a system for avoiding the deleterious factors associated with the utilization of steel fittings in moisture-laden and other corrosive or contaminating environments.

40 An in-place molding technique is preferred for the installation of the protective routing sleeve 10 of the present invention. The polypropylene material is applied by use of conventional injection molding dies in which pressure in the range of 45 80—100 pounds per square inch are employed. A favorable temperature range has been found to be approximately 400° Fahrenheit, plus or minus 20°. It is also noted that in-place injection molding of the latter sleeve 10 about the hose 50 connector interface 32 provides a means by which the fixation of the sleeve 10 to the assembly 17 is superior to that of other devices not molded in place. Thus the adherence of the sleeve 10 to the assembly is enhanced by a natural shrinkage of 55 the sleeve which occurs during the cooling of the polypropylene material about the elastomer hose after the injection molding dies are removed.

Inherent to the nature of the helical structural spring body portion 12 is that both the axial and 60 radial flexibility of the sleeve 10 are assured as the

hose member 18 undergoes flexure and bending movements in a variety of planes. Thus, the protective sleeve 10 also has a superior routing control capability in hydraulic brake hose

65 assemblies, which are subject to such movements.

It will also be seen that the flat circumferential surfaces 26 of the helically ribbed body portion 12 of the sleeve 10 provides means for achieving abrasionless contact of the hose

70 member 18 against mechanical members external to the hose, and which might otherwise abrade or cause damage to the hose during its useful life. The molded interface 32 provides a mechanical lock between the annular end 14 and the flared

75 end 30 of the element 20. Moreover, to the extent that the annular ends 14 and 16 are an integral part of the single-element sleeve 10, and thus provide additional means for gripping the assembly 17, there is less tendency for the body

80 portion 12 to slide axially along the hose member 18 as the latter undergoes flexure and bending motions. The ends 14 and 16 also aid to avoid end gouging or localized abrasion of the elastomeric hose material, which has been a major drawback 85 of the steel protective coil springs of the prior art.

Thus, the protective helical routing sleeve 10 for hose assemblies of this invention provides an improved resilient flexible tubular member which is markedly more suitable for hose assemblies 90 than were previously available routing members. Additionally, the non-corrosive attributes of the sleeve 10 enhance its utility in moisture-laden environments, particularly where such devices involve steel fittings.

95 CLAIMS

1. A tubular sleeve disposed for installation over a tubular hose assembly comprises a structural body portion defining a helical member, and a pair of annular members, each integrally 100 affixed to an end of said helical member.

2. The sleeve of claim 1 wherein said sleeve comprises a single-element body of resilient, molded, corrosion-resistant material.

3. The sleeve of claim 2 wherein said resilient 105 molded material is polypropylene.

4. A brake hose assembly comprising a hose member having a connector element at one end thereof, a flexible, abrasion resistant, protective routing sleeve molded onto said hose member and 110 said element, said sleeve comprising two annular end portions and a helical rib portion extending axially between said end portions, wherein said rib portion is integrally joined to said end portions.

5. A tubular sleeve substantially as described 115 herein with reference to, and as shown in, the accompanying drawings.

6. A hose assembly substantially as described herein with reference to, and as shown in, the accompanying drawings.